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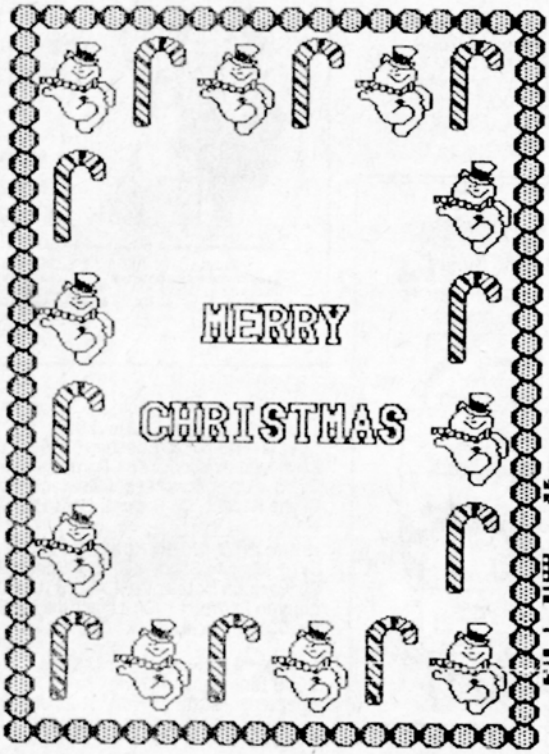

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Telecommunications Issue, 2068 Program Tips, How a Compiler Works, Rotating Globe, Byte-Back Modem, TeleCommunications for Beginners, Switching-4, WORM-3 (concluded). and More!

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TS 1000 Music Program (White), 2068 Plotter, 2068 Character Set (Young), Address Program, Nine Reviews, Tele-Communicatons Column, Etc.

Issue #9, October/November 1984
ANNIVERSARY ISSUE, 2068 Spirograph, Higgenbottom Interview, FORTH for TS Computers, Spectrum Section, Switch-5, TeleCommunications, Reviews, etc.

Issue #10, December 1984
40 PAGES, Making BackUps of 2068 Software, Banner Programs (1000 & 2068), QL, TS1000 Program Tips, Christmas Program, RS100 vs. TS1000, MTermII Horizon Awards, Switch-6, TSUGs, More!

Issue #11, January 1985
40 PAGES, Lower Case on the TS1000/ZX81 (2040 printer), 2068 Word Processor Evaluation Pt.1 (Ferrebee), Bar Graph Program, Experimenting with Byte Back Modem, Switching-7, INDEX of Issues 1-10, Reviws and More.

Issue #12, February/March 1985
2068 Mass Storage, Software from England, TS1000 Program Tips, 2068 Word Processor Eval.-2, Bank Switching Concluded, MTerm Patches, 2068 Tutorial.

Issue #13, April 1985
Complete 2068 Word Procssor Listing, TS1000 Simulated READ-DATA, WORM Enhancements (1000), User Defined Graphics (2068), "Try These," Changing Fonts (2068), and More!

Issue #14, May/June 1985
Special HARDWARE issue, TS1000 Keyboard Add-on, ZX81 Rampacks on the 2068, Surge Suppressor Project, User Group Report, QL Report, Cassette Tips.

Issue #15, July/August 1985
Byte-Mapped Scroll (2068), Spectrum Conversion Notes, VU-CALC with 80-column Printer(1000), Machine Code (1000), 8 Reviews, QL, Etc.

Issue #16, November 1985
2068 Line Renumbering (Bell), MTerm on Spectrum, 2068 Clover, Stopper Program (1000), Quick Balance, Logic Families, Sinclair World, News and Reviews.

Issue #17, February/March 1986
FastBox Trilogy (1000), Banta KeyFinder, 2068 Screen Save (Bell), 3D Fractals (2068), 2068 Little Goodies, INDEX - Volume 2, Issues 11-16, Reviews.

Issue #18, April 1986
Software Protection, Partial Pascal Review with Program (1000), Etch-Ah-Sketch (2068), Mikrodrive Backups, Filler Up(1000), Pixel-by-Pixel Screen Scroll,.

Issue #19, May/June 1986
2068 Video Modes, Revising Hunter Board, New Wafadrive Column, Quadratic Equations, 2068 Bank Switching Part 1, Zebra Designer Tips, InQLings, etc.

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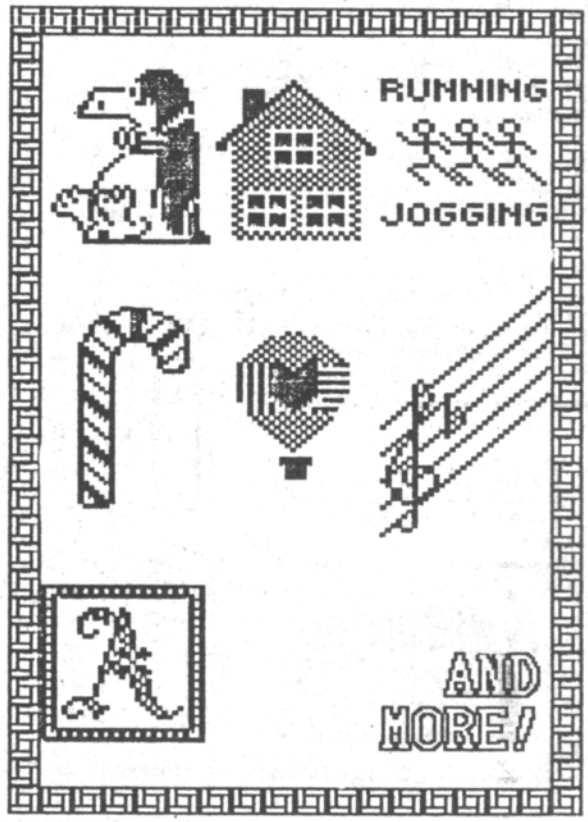

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IMPORTANT NOTICE TO SUBSCRIBERS:

Dear Readers:

First of all, I am very sorry to be so late with this latest issue. I guess TS Horizons has really lived up (down?) to its reputation for lateness this time. Although we have gotten a lot of letters complaining about poor service and inconsistency, we still receive a lot of patient, supportive letters from readers who love us and despite our faults. That makes it hard to say what I'm about to tell you.

TS Horizons No. 29 will be the last issue published. That's nine more issues including this one. For that reason we have withdrawn all of our advertising in other publications.

☐We will be accepting subscription **renewals** but for the number of remaining issues only (at the rate of $1.80 for each issue desired).
☐**New subscriptions** received will receive refunds by mail for issues beyond No. 29.
☐If your **current subscription** extends beyond issue No. 29 you may receive back issues, if desired for the extra issues.

It's been a great three years. I really hate to come to this. The remaining issues will be among are best I hope, and I really want to get all nine of the them out in 1987.

The only alternative I see presently is some sort of partnership (either with an existing publication or other individuals who would be interested in sharing the workload or even taking the publication over to a large extent - if anyone would happen to be interested in such an arangement please contact me). At any rate most of you should know that I would not follow the example of several other publications before TS Horizons, that just dropped out sight when the going got rough.

SLOWEST CATCHUP IN THE WEST

ANOTHER apology! I was hoping to have an extra large issue of TS Horizons this time around, in order to "catch up" a little, but unfortunately as you can see this issue is another regular sized issue." The Ultimate ZX81", Bernard Bush's Graphics programs, and "Little Goodies for the 2068" will appear in the next issue (and much more).

However this issue, does contain the two concluding chapters of Bill Pedersen's Bank Switching Series, the return of Peter McMullin, and a brand new (I hope you like it) feature, TS Funnies. Let us know if you like it and maybe we can run some more of it. (Do you think Tim Woods of Time Designs can take a joke?)

By the way, the strange box-like creature in the comic strips below is intended to be the mascot from **SYNC magazine**, an animated ZX81 with legs and arms. I made some changes - like adding a face and simplifying the rest of his design - and "hired" him to work for TS Horizons. The other character is intended to be yours truly.

TSH

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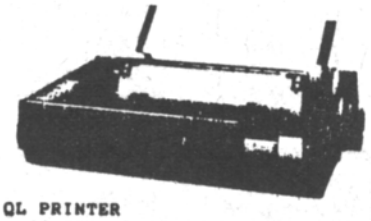

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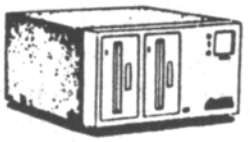

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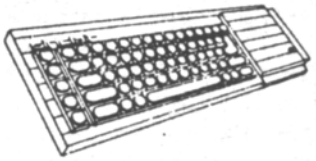

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The Wafadriver Column "IN SPEC" "Wafer Tips" by Frank Davis

This issue I thought I would catch all of you up on a few tips I have picked up on the subject of wafers for the Rotronics Wafadrive. Many of them you may have noticed for yourselves, but for those new Wafadrivers they may come in handy.

The first thing is that I recommend that you format every new wafer you use several times before you trust it to hold a precious program of yours. The reason why is that they have a thin tape inside the wafer that, like all magnetic tape, is subject to a small bit of stretch after a bit of use. By formatting the tape a few times you take care of some, and perhaps all of the stretch before you put a program on tape. This will take a small amount of time to do but is better than geting a "faulty wafer" report when your favorite program will no longer load for you. You should still backup all of your programs on another wafer. I use many of my 128K Wafers solely for keeping backups of my programs.

Most all of you have noticed that when you format a 16K wafer that it will usually format out at actually 19 to 20K to a wafer. The same is true for 64K wafers that format out at around 70 to 73K to a wafer and the 128K wafers at 130 to 135K. nothing is wrong with your Wafadrive. The K (which stands for 1024 bytes) given on each wafer is the minimum number of K to a wafe, not the exact number that you get.

The wafers that we use in our Wafadrives are the same ones used in the newer (the majority) of the A&J Microdrives. So if you have bith, feel free to borrow from the other. However they will not be able to run each other's programs anymore than a disc for a Commodore will run on an IBM. You can feel safe in buying wafers if you need them for either machine. Another place or two you might look for wafers if you need them is a Service Merchandice Store, Labelles, etc.... or a local Sith-Corona dealer. The SCM company has a word processing machine that uses the same wafers to store text. These wafers usually format out at 72 to 74K.

My last word on the subject of tape stretch: I have found that evry once in a while on both my A&J and my Rotronics Wafadrive that if I have a wafer that after quite a bit of use starts to show up with faulty sectors or has to run through part of the program more than once to get loaded, this too is due to stretch. What I do is copy the program over onto another wafer, then go ahead and re-format the once faulty wafer. All but once this "cured" the wafer that was giving me trouble.

Many of us who use the Wafadrive have wished for a suitable program for us to use that matches the power and utility of Pro/File 2068. I HAVE RECENTLY HEARD OF TWO PLACES OFFERING SUCH AN ANIMAL.

The first place is DEERING Imaginering, 136 Neverbreak Dr., Hendersonville, TN 37075. Mr. Deering will sell you a copy of PRO/FILE if you will: 1) supply a copy of your original PRO/FILE on tape or proof of purchase of the program, and 2)send $9.95 +.50 postage. I am sure that if you just want it on tape to use in Spectrum mode without the Wafadrive he will be able to help you in that area also.

Also according to the Sept/Oct isue of SINCUS NEWS, "NEWS FROM TIMELINEZ, P O BOX 1312, PACIFICA CA 94044 has some data via the TAS BAM USER'S GROUP, P O BOX 644, Safety Harbor FL 33572 - the people at TAS BAM have with Tom Wood's blessing modified PRO/FILE to operate on the Rotronics Wafadrive system. If interestedsend a request for data with a SASE."

Check one or both of these out and you could find you have an excellent database program ready to run on yor Wafadrive. By the way, Damco Enterprises is now offering Campbell's Master File on Wafer for those looking for a good database other than PRO/FILE 2068.

If you have anything you would like ot sdhare with our fellow users - tips, questions, short routines - for the Wafadrive, or a program you would like to have reviewed, send these along with a SASE to me at: Frank Davis,513 East Main St., Peru IN 46970. TSH

By Peter McMullin ZX81 RESOURCES: • Larken Drives • EPROM Services • MODulo Graphics

2068 USERS TAKE NOTE: Will wonders never ceasel Every single topic in this month's ZX81 Resources applies to your computer too.

LARKEN DISK SYSTEM

After using the Larken for a couple of months now, I must say it meets or exceeds all expectations. The DOS (ZX-LDOS) is certainly the most sophisiticated available for the ZX81, but its operation is simple, logical and well-documented. LDOS lends itself extremely well to user-written DOS utilities for damaged track recovery, etc. The ability to Save and Load BASIC, ARRAY and CODE files up to 47K long makes it a winner, providing programmed data manipulation capabilities never before possible. The DOS commands and disk format are identical to the 2068 version, so CODE written on a 2068 and saved on a 2068 Larken disk may be loaded by a ZX81 from the same disk!

The system has been 100% reliable without exception, and for CDN$124.00 or US$100.00 delivered, it remains an outstanding deal. A complete review, discussion of the DOS, DOS utility listings, and a comparison with the AERCO FD-ZX will appear in these pages in an upcoming issue. The system is available from Larken Electronics, RR#2 Navan, ONT Canada K4B 1H9.

EPROM SERVICES PROGRAMMER

I recently received a sample unit of the EPROM SERVICES PROGRAMMER MK.1, sent for evaluation by Larry Chaverie of Ottawa, Ont.

After using this devise, I decided I liked it well enough to order one for myself. Although the unit is costly compared to the JLO Programer, the features justify the price.

As opposed to the JLO unit, which is memory mapped, the E/S Programmer is completely port-mapped. The programmer, like the JLO, is a male card peripheral designed to plug into a motherboard. It measures approx. 3.6"w x 3.5"h, with a 28-pin Zero Insertion Force socket. An 8-pole DIP switch next to the ZIF socket for the EPROM permits the selection of Intel type 2716, 2732, 2732A, 2764, 27128, and TI type 2516 and 2532 EPROMs.

The programmer is centered around an 8255 PIA chip, giving port-mapped control of all EPROM pins. An onboard switching-boost regulator provides the 21V or 25V programming voltage without the need for a seperate power supply. Switching of the programming Vp is done automatically under software control. Eproms may be inserted or removed safely without powering down, permitting several EPROMs to be programmed without having to power down and reload between each one.

The truly remarkable part is the software. 1K (ZX81) or 1.5K (Spectrum/2068) in length, the Machine Code software is available in 11K-12K or 31K-32K versions for the ZX81, and 30.5K-32K or 62K-63.5K versions for the Spectrum or Spectrumized 2068.

An 11-option menu provides choices of: *TEST (compares each bit in EPROM with code to be programmed - it may be possible to overwrite a programmed EPROM), *COMPARE (an area of EPROM with an area of memory), *COPY (an area of EPROM into memory), *CLEAR (an area of memory to FF hex), *PROGRAM (see later), *CLEAN (check that EPROM is erased), *REPEAT (program another EPROM, same parameters), *E.DUMP (hex listing of EPROM), *M.COMP (hex listing of memory), *PARAMETERS (lets you check before REPEATing), and QUIT (to BASIC).

When performing a PROGRAM, or any of the EPROM checking operations, parameters must be entered for start address of DATA, starting address in EPROM, and LENGTH of data. Entry is in hexadecimal format. When PROGRAMing an EPROM, menu selection is made of EPROM type, parameters are entered, and the program takes over. First, the parameters are tested for validity. Then the EPROM is TESTed to see if it can be successfully programmed. If all is well, the programming Vp is switched on and programming commences. During programming, each byte is checked to see if

programming is necessary, and if so, up to 4 attempts are made to program it. A verify is performed after each attempt. If the verification/retry fails, the program returns to the menu with a report of the failed address. Programming may be aborted at any time, with a report of the address about to be programmed.

I have found the EPROM SERVICES Programmer 1 to be very convenient and reliable. The capability of programming 27128 EPROMS with none of the complications inherent with a memory-mapped programmer is a definite plus. The ZIF socket, switching flexibility, self-contained Vp source, and fancy software, as well as the ability to change EPROMs "on the run" makes this a very impressive unit. All this luxury doesn't come for free, though.

The Programmer 1 sells for £64.95, from EPROM SERVICES, 3 WEDGEWOOD DRIVE, LEEDS LS8 1EF, ENGLAND.

MODified SHAPES FOR THE T/S

This programming feature is adapted (well OK, cribbed) from the article " MODified Shapes for IBM", in COMPUTE!, MAY 1986 issue, written by Paul W. Carlson. This month, we'll discuss the background, and cover 1 of 4 programs which create nifty geometric patterns.

The program listing provided here will RUN on the ZX81/TS1000 with Oliger/TI Video and Silicon Mountain's JOBASIC or PIXL-ATR. It will also run on the 2068, but with reduced color resolution.

The object of Mr. Carlson's article was to illustrate some interesting uses of the MOD (Modulo) command in IBM BASIC.

"MOD gives the integer (whole number) remainder of an integer division. For example, 17 MOD 3 = 2, because 17 divided by 3 equals 5, with a remainder of 2.

"Although some dialects of BASIC don't include a MOD operator, the INT function can be used for the same purpose. In Microsoft (or Sinclair) BASIC, the expression K-INT(K/J)*J gives exactly the same result as the IBM BASIC expression K MOD J.

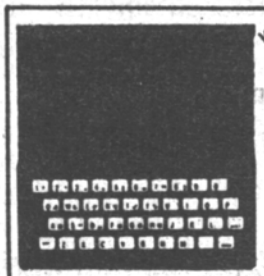
"One of the most common uses of MOD is to test whether a value is odd or even. The expression X MOD 2 yields a 1 if X is odd, or a 0 if X is even."

Next issue we'll discuss the use of Modulo arithmetic in further depth, and examine the operation of the following.

*Can also be adapted for std. ZX81 or TS1000 with Callisto Software's GRAPHICA, or N. Elmaleh's SW HI-RES.

```
 1 REM MODified Triangles for Timex-Sinclair
 2 REM ZX81: INITIALIZE JOBASIC OR PIXL-ATR VARIABLES
 3 GOTO 40
 5 REM MODULO SUBROUTINE
 6 LET RES=ARG-INT (ARG/MOD)*MOD
 7 RETURN
10 REM IBM> TI/2068 PLOT SCALING
15 LET XX1=(X1/1.25)+XSET
20 LET XX2=(X2/1.25)+XSET     *2068: USE
25 LET YY1=191-(Y1/1.1).       YY1=175-(Y1/1.3)
30 LET YY2=191-(Y2/1.1)        YY2=175-(Y1/1.3)
35 RETURN
39 REM TRIANGLE ROTATION
40 DIM X(3)
50 DIM Y(3)
60 DIM Z(3)
70 DIM T(3)
80 LET XSET=1
100 LET SU=.1
110 LET RU=1-SU
120 LET II=1
130 LET C=1
200 FOR J=0 TO 3              *LOOP THRU J COLUMNS
210 LET II=-II                 AND I ROWS
220 LET JJ=1
230 FOR I=0 TO 6
240 LET JJ=-JJ
250 IF I<J OR I>6-J THEN GOTO 1100
300 IF J<2 OR I>2 THEN GOTO 320
310 GOTO 400
320 LET ARG=C                 *ADVANCE COLOUR MOD 3
330 LET MOD=3
340 GOSUB 5
350 LET C=RES+1
400 IF J=3 THEN GOTO 420
410 GOTO 500
420 LET ARG=C                 *ADVANCE COLOUR MOD 3
430 GOSUB 5
440 LET C=RES+1
500 LET X(1)=0
510 LET X(2)=39
520 LET X(3)=78
530 LET Y(1)=0
540 LET Y(3)=0
550 IF II=JJ THEN GOTO 580
560 LET Y(2)=-48              *CHANGE Y(2) VALUES TO PLOT
570 GOTO 600                   SOME POLYGONS UPSIDE DOWN
580 LET Y(2)=48
600 FOR N=1 TO 11             *LOOP THRU N ROTATIONS
610 LET X1=3+X(3)+I*39
```

```
620 LET Y1=175-Y(3)-J*48+II*JJ*24
700 FOR M=1 TO 3              •LOOP THRU M SIDES
710 LET X2=3+X(M)+I*39
720 LET Y2=175-Y(M)-J*48+II*JJ*24
730 LET ARG=C
740 GOSUB 5
750 LET C=RES+1
800 GOSUB 10
802 REM SET INK COLOUR BY VARIABLE C
803 REM C SEQUENCES MOD3 +1, IE 1,2,3,1,2,3,1...
809 REM DRAW SIDE (JOBASIC):
810 IF USR V THEN LPRINT D;XX1,YY1;XX2,YY2
814 REM DRAW SIDE (2068):
815 PLOT XX1,YY1:DRAW XX2-XX1,YY2-YY1
820 LET X1=X2
830 LET Y1=Y2
840 LET ARG=M
850 GOSUB 5
860 LET NJ=RES+1
900 LET Z(M)=RU*X(M)+SU*X(NJ)
910 LET T(M)=RU*Y(M)+SU*Y(NJ)
920 NEXT M
1000 FOR P=1 TO 3     •MOVE RELATIVE COORDS
1010 LET X(P)=Z(P)      FROM "NEXT" ROTATION
1020 LET Y(P)=T(P)      TO "CURRENT" ROTATION
1030 NEXT P
1040 NEXT N
1100 NEXT I
1110 NEXT J
1200 IF INKEY$="" THEN GOTO 1200
1210 STOP
```

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See September 1984 issue of 73 for TIMEX/RTTY article

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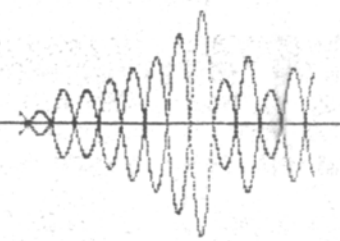

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TOTALLY SAFE MACHINE CODE FOR THE ZX81 AND TS1000

by William J. Pedersen.

Rather than starting by beating a dead horse, the answer will precede the explanation.

Here are two templates:

```
    1 REM.....1.....2...
.....3.....4.....5.....
....6.....7.....8.......
..9.....A.....  /.
    2 REM.....1.....2...
.....3.....4.....5.....
....6.....7.....8.......
..9.....A.....B.......
 /.
```

Template #1 provides 112 bytes of machine code space. When more than 112 bytes are needed template #2 is added. Template #2 provides 122 of machine code space. When still more space is needed, template #2 is copied to line 3, etc., as many times as you like.

Program memory begins at **10509**. The following chart shows the memory addresses where the template are stored. The addresses ***** are especially important. Your machine code can be **POKE**d into the text area of any template, with one restriction (but an important one).

Nowhere in your machine code can **CHR$(118)** [="**ENTER**"] appear! The computer will interpret it as the end of the REM statement, with disastrous results.

FORMAT	1 REM	2 REM	3 REM	4 REM	5 REM	...
MSB LINE #	16509	16627	16755	16883	17011	...
LSB LINE #	16510	16628	16756	16884	17012	...
LSB LENGTH-4	16511	16629	16757	16885	17013	...
MSB LENGTH-4	16512	16630	*****	16886	*****	...
CHR$(234)="REM"	16513	16631	16759	16887	17015	...
START OF TEXT	16514	16632	16760	16888	17016	...
...	...	...	...	...	...	...
END OF TEXT	16625	16753	16881	17009	17137	...
CHR$(118)="ENTER"	16626	16754	16882	17010	17138	...
TEXT BYTES	112	122	122	122	122	

Avoiding **CHR$ (118)** in your machine code is always possible, but there are sneaky ways it can get in there without you being aware of it. Either byte of a two byte **CALL** or **JP** address might accidentally be **CHR$(118)**. The first sneaky addresses in RAM are: **16502, 16758, 17014, 17270**, etc., by increments of 256 bytes.

Ah hah! The templates hide these under *****, so you do not have to worry about them. Don't stop worrying yet though.

There are two more cases that require caution.

The first is another sneaky one, but simple to avoid. Never use "**JR ___, +120**". Use "**JR___,+121**" and add a NOP instead.

The other case is obvious, but harder to fix. "**LD___,118**" and "**CP 118**" cannot be used.

For "**LD ___,118**", use "**LD___,117: INC ___**".
For "**CP 118**", use "**CPL : CP 37 : CPL**".

In brief, never use:

"**JP ___, +120**",
"**LD ___, 118**", or
"**CP 118**".

The result is perfectly safe machine code which can be edited, added to, and saved to tape. (All right, you experts: you can't use I/O device **(N)=118**, and you better use **(HL)** when addressing ROM routines.)

HEY! It works! Forget the dead horse.

The weird doodad (**/.**) at the end of the templates is simply three NOPs followed by **JR +6**. It comes in handy when your code runs into the next template.

One last hint -- keep a spare copy of both templates. **TSH**

BANK ⟺ SWITCHING...
The TIMEX/Sinclair 2068 Computer

by William J. Pedersen

PART III

Before discussing the roll of the SCLD in bank switching, it is desirable to summarize the known functions.

1. SCREEN MAINTENANCE

This is the highest priority operation. The HOME RAM with addresses in chunks 2 & 3 (DRAM) belongs to the SCLD. The CPU has to beg permission to access it. If access is not granted, when the SCLD is busy, the CPU clock signal is frozen high, putting the CPU in a state of suspended animation.

There are three screen operating modes. At start-up D_FILE1 & A_FILE1 are used to create the screen display. There are 255 pixels per active screen line. INK and PAPER colors are defined for 8x8 pixel character space.

In extended color mode, there are still 256 pixels across the screen, but now D_FILE2 is used to provide INK and PAPER colors for each 1x8 space. Neither A_FILE1 nor A_FILE2 is used, making the space available for other purposes.

BRIGHT and FLASH are also specified in addition to color for these two modes.

In 64 column mode D_FILE1 and D_FILE2 are combined to double the horizontal resoluton to 512 pixels per line. In this mode the INK, PAPER, and BORDER colors are fixed for the entire display.

Dual screen mode is the same as normal, except you have the choice of using D_FILE1 and A_FILE1 or D_FILE2 and A_FILE2.

The display mode code and 64 column mode color selection are stored in the lower six bits of the read/write register at port address 255. The BORDER color is write-only to the lower three bits at port address 254. The SCLD does the port address decoding and maintains these two registers.

2. KEYBOARD MONITORING

A read-only register is maintained at port 254. Though all 16 bits of adress are required, only trhe lower eight are decoded. Keyboard data are read from the lower five bits.

3. TAPE INPUT MONITORING

Bit 6 of the read-only register at port 254 is assigned to this function.

4. TAPE OUTPUT AND BEEP

Bits 3 and 4 of the write-only register at port 254 are assigned to a two-bit digital-to-analog converter. With bit 4 off, bit 3 generates the tape signal at too low a level to overcome the bias to the speaker circuits. Toggling bit 4 generates beeps. If bit 3 happens to be low, some 2068s suffer loss of sound. OUT 254,255 should fix this. (White border)

5. SOUND AND JOYSTICK OPERATIONS

In this case the SCLD supports no registers but does decode port addresses 245 and 246 to a pair of signal lines. With both lines active, the port 245 write-only steering register (4 bits) is enabled. When only one or the other line is active, a read or write is enabled for the selected register between CPU and PSG through port 246. Though the I/O "A" register is one of these, it is configured as an input or output port to the joystick connectors. When in input mode, it cannot be written.

6. KEYBOARD INTERRRUPT GENERATION

Immediately after completing a display frame, the SCLD issues an interrupt (also supplying a pull-up resistor) to the CPU. It can be blocked by writing a "1" to bit 6 of port 255 without disabling interrupts from other sources.

7. LOCAL MEMORY SUSPRESSION

Local memory consists of the HOME RAM, EXROM, and the DOCK. On receipt of the BE signal, no local memory is enabled. This is required when EXBU banks 1 through 253 are established and actively reside in chunks.

8. HOME MEMORY SELECTION

The SCLD decodes address bits A14 and A15 to generate four memory enable signals in blocks of two chunks each . Unless address contention exists, this is independent of display generaton. Often two are active simultaneously. (It is possible for the SCLD to redirect the CPU request to a different block of RAM. This has subtle implications.)

9. EXROM AND DOCK BANK SWITCHING

Bit 7 of port 255 is a steering bit. When set, EXROM will be found, otherwise the DOCK bank. The SCLD decodes port address 244 and maintains a read-write register called "horizontal select" (HS). Its bits correspond to chunks. A bit set to "1" means that a CPU request to that chunk will find EXROM or DOCK instead of HOME memory.

The two are mutually exclusive. You cannot have EXROM in one chunk and the DOCK in another.

This limited part of the bank switching system works--up to a point. It is difficult to address EXROM or DOCK above chunk 1.

Added memory, except EXROM and DOCK in chunks 0 and 1, is not selected by the SCLD. You must provide the chunk address decoding of A13 thru A15; and multiplexing if needed for dynamic memory.

10. CONTENTION RESOLUTION

While the SCLD is busy with screen maintenance, it operates an independent DRAM data and multiplexed address bus at high speed in a special way. When not busy, a CPU request for DRAM access is honored by issuing signals which open address and data gates between the CPU and SCLD busses. The data gate is bidirectional but the address gate is one-way.

Contention also exists when the CPU requests access to any or the SCLD ports. This is why the design of "hyperloaders" must take into account the fact that the tape signal cannot be sampled more than 15,750 times a second. This resolution limits the amount of tape speed error permissible during all tape operations.

11.HOME MEMORY MULTIPLEXING & REFRESH

The SCLD provides this service for the CPU concurrent with screen maintenance except during contention. It also provides A7R to help in external multiplexing.

This includes all the SCLD functions which have been explained adequately if not clearly in the literature.

Is it possible to discover its other secrets without a map? Shades of Sherlock Holmes--let's have a go at it. What evidence do we have?

There is physical evidence. Much of it has little to do with bank switching, but should not be prejudged.

1. The 2068 contains a "daughterboard". The schematic has an error. The bus connection is to MERQ, not WR as shown. It also shows jumpers G-G and H-H. These are actually cut-and-jump locations. There are no terminals.

The function of this board is to remove contention when chunks 2 and 3 have been bank switched and no longer contain HOME RAM.

The cut-and-jump locations become important when BUSREQ acts to take over the system bus.

2. The rear connector pads for DZIN, DZOUT, BUSISO, and one unassigned connection are not designed for internal wiring. The pads have no traces, holes, nor free area to take solder, so...
   a. These signals must be provided by an external device.
   b. The signals are not needed internally.

The most likely assignment for the free bus line is BUSGRAB. This is the signal line used externally to control the direction of data from a buffered bus. The source of this signal must be the active addressed device being read, no matter where it is in a buffered bus network.

3. The connection marked IOA5 is shown connected to the wrong pin. This can cause confusion when reading or writing code.

4. Neither joystick connector has the ground shown on the schematic, though it can be

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jumped. This might have been done to reserve a pin for future expansion. It is not hard to pick up this ground connection when devices are added that use the joystick ports. The +5V is present. Pin 5 seems to have been reserved for a joystick with a second button if the schematic notation at the switching voltage regulator means anything.

5. Address line A13 is connected to the SCLD!

NONE OF THE DESCRIBED FUNCTIONS USE OR NEED IT!

6. The pull-up resistor on D2 has a simple task. It acts as a RESET to the 2040 printer while initializing.

7. The pull-up resistor values for RESET, BUSREQ, WAIT and NMI represent the number of devices which can be "wire ORed" together on each line. The lower the resistance, the more can be attached. Devices issuing BUSREQ outnumber those issuing WAIT. Only a few devices can issue NMI; commonly very fast devices.

There is a very rich body of evidence in the bank switching and initialization code. Even more exists where TIMEX put in roadblocks in ROM to keep unsupported features from messing up the user. Many of these roadblocks can be removed by replacing them with NOPs, but not everything is that simple. Most of them can be intercepted using ON ERR and the GO TO version of the USR call.

What is important here, is that the roadblocks have interfered with testing how the system works.

At this time, I must digress. The full disclosure of how the TIMEX system works takes so many pages that it would be unfair to have it bump other important articles from publication. It would be equally unfair to stretch it out over time.

I mentioned IEEE 488. There is also the "boxes and boards" method used by the AMIGA, the DAISY CHAIN used by the C64, and for simpler applications with the TS2068. They vary in how much external hardware is needed, but the 2068 protocol makes them all possible.

Part 4 will describe the basic bank switching controller, but implementing it in hardware depends on how far you want to go.

Half the fun is trying to solve the riddle yourself. With that in mind, I give you a starting point. You have already seen a few good clues, but clues do not take the place of active investigation. Some of you will flounder. Others will take this tiger by the tail and twist it.

The 2068 WILL WORK in all three interrupt modes. In IM1 (as initialized) the SCLD provides the only interrrupt--and that is used to interrogate the keyboard. Before we can use most peripheral devices and bank switching, this must change.

At 3382d in the initialization is the code to load the Z80 I register. It is followed by six NOPs to

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allow any device that might be listening time to digest it. The initial value is 63.

Later, at 3480d, we find IM1 followed by one NOP, partly for the same reason.

Is the SCLD listening? There is an old saying, "TEST. DON'T GUESS." (Though my wife said I better not).

If so, entering IM0 would require that an instruction be put on the data bus in response to the CPU interrupt read cycle. If nothing responds, the data bus will be all ones. This is RST 56 which is the correct instruction. It might be necessary to add pull-up resistors for reliable operation.

This is the 8080 compatible interrupt mode. Because the SCLD does not need to do anything different, this test might not tell us anything.

Entering IM2 is a different story. The interrupting device is responsible for providing an interrupt vector with bit 0 = "0".

If the SCLD does nothing, an invalid odd vector (255) will be read, resulting in a crash.

The Z80 "I" register (value 63) establishes the base of the vector table at 16128--pointing to the character set in ROM. A crash is assured even if the SCLD provides a valid vector.

Changing the value to 74 puts the vector table where it should be: at 5E00h.

A crash is still assured unless we build a table there. For test purposes, all 128 entries should point to the keyboard interrupt routine at 62AE. With this single-minded table, any vector supplied by the SCLD will act the same as in IM1.

If it crashes, the SCLD was not listening, or we did something wrong. Don't forget to code those six NOPs after loading "I".

Because of the 15,750 Hz limit on sampling rate (the vector table is in contention space), these interrupt pointers cannot be used for really fast devices.

For high speed, the non-maskable interrupt (NMI) is needed. This requires using an external interrupt manager chip. An alternative is to provide additional vector tables outside of contention space. It is simple to switch tables.

The connection of A13 to the SCLD is explained when we examine the code for WRITE_BS_REG AT 635Ch and READ_BS_REG at 63AD. As far as the CPU can see, WRITE_BS_REG is a multibyte NOP. Though the same cannot be said for READ_BS_REG, both routines leave with RAM and the PSG in their original states.

Now THIS is "doubletalk". The SCLD is listening during this time for its instructions. How does it respond? It sends signals through the joystick port.

What else does it do? According to published information it just about takes over the computer.

DON'T YOU BELIEVE IT!

TEST. DON'T GUESS.

Part IV will explain the basics of real bank switching, though it cannot give you actual examples of working circuits. As you should be aware by now; bank switching is but one element in the larger task of peripheral management. It is a tool...not an end in itself.

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PART IV

It was said that the SCLD outputs signals through IO port "A". This is a perfect example of a half truth which can totally misdirect an analysis of the true circumstances. It is akin to the text book discussions about the SCLD wresting control from the CPU when in fact it *yields* it.

In the same way, DZIN and DZOUT are deliberately misleading as labels, though a corporate executive might strongly argue that. In the view that the TS2068 is the BOSS, these labels could have some validity, but only for TIMEX products which were never produced. Such being the case, the entire data published about the TIMEX bank switching controller is:

PURE FICTION!

There *might* have been one. One *could* be made to those specifications and protocol, but it would be meeting corporate goals.

DZOUT is bidirectional, as is DZIN. Not only that, neither signal implies daisy chaining. (They are analogous to IFC and NDAC on the GPIB buss.) The direction depends on which device is the current BUSS MASTER. In a network of computers the 2068 might be boss, but more likely it would be an intelligent TEMINAL. As a SLAVE, it will never issue DZOUT, but it will respond by completing current operations and releasing DZIN. When all the slaves have released DZIN, the BOSS that sent DZOUT takes over.

Actually it is more accurate to say it is the bank switching controller rather than the 2068 which provides these features, but "bank switching controller" is another misleading choice of words. "Peripheral Control Adapter" is a much better name.... but lacks the pizazz some would demand. GPIB is close, but...

The 2068 does contain part of a Peripheral Control System. This part is NOT FICTION! It is REAL! It is there to USE!

The SCLD permits, or rejects, reads and writes to any ports or memory under its control. It is not in any way the source of signals to IO port "A", but it does send interrupt and sync data to whatever CPU might be in control of the buss. A stop-action DEMO program called "Sherlock

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Zebra Catalog Updates

The following are typographical and other corrections to Zebra's 1986B Catalog.

Page 1 - We do not cary Omnicalc.

Page 5 - The correct cat# for Profile 2068 is TW02.

Page 6 - The last sentence of the first paragraph is in error. New A&J TS2068 drives use black, version 1 wafers.

Page 8 - The correct catalog numbers for the following cartridges are 07-7400 Pinball, 07-7300 Flight Simulator, and for cassettes 06-1000 Vu-Calc, 06-1001 Vu-File, 06-1002 Vu-3D, and 06-3000 Flight Simulator.

Page 12 - MTERM II Tape is currently priced at $24.95 not $29.95. MTERM II is not available on cartridge. We no longer sell Mini Xmod 1.7.

Page 14 - We are now sold out of 03-3020 Computer Coach, and 03-3016 Conversational Spanish.

Page 15 - We are now sold out of the following Softsync TS1000 software: SST02 Advanced Budget Manager, SST18 Mothership.

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Cat# SS05

Machine Code programming is made simple with Zeus. This sophisticated programmers' aid allows the use of the full Z- 80 mneumonic instruction set and comes with a step by step instruction booklet.

Unique features include: a full screen editor, automatic line numbering and renumbering and mini monitor. Displays current registers and single stroke commands save machine code.

Zeus Monitor and Dissassembler

Cat# SS06

Acclaimed by reviewers as the most comprehensive Monitor and Dissassembler available.

This powerful programming tool allows you to translate machine code into comprehensible assembly language instructions, enabling you to examine the BASIC ROM, to investigate the workings of the Timex/Sinclair 2068 or to analyze your own machine code routines.

With the highly versatile Monitor, you get an extensive set of facilities to aid the entry, inspection, modification and debugging of your own machine code programs.

CYBERZONE

Cat# SS02

Special Feature: Use your voice to activate your laser fire! The sound of your voice sends lasers shooting at the enemy.

Imagine yourself pitted against the Cyber's ultra accurate laser fire. The situation is tense as you avoid the swooping, spinning fighters coming to get you.

Can you stay alive long enough to chip away at the floor of Cyber's spinning spacecraft? And is your aim deadly enough to hit the Cyber's only vulnerable spot...his left foot?

Cyberzone is a fast game with five levels of play and exciting graphics that place you in the center of the action.

Personal Accountant #SS04

The Personal Accountant is a powerful yet purposefully simple accounting program for household and small business use. Using a time honored accounting practice known as "Double Posting Book-keeping" the Personal Accountant will instantly organize all your financial information.

Open as many accounts as you need, balance your checkbook instantly, track loans, charge card purchases, expenses and IRA's. Generate financial reports ranging from trial balances to profit/loss, expense vs. income and assetts over liabilities. An amortization table can calculate payments and changing rates, generate future value and growth tables. And a built in data base keeps names, addresses and other vital data at your fingertips.

The Personal Accountant is comprehensive yet simple to use with no codes to memorize and the screen will guide you every step of the way.

VOICE CHESS

Cat# SS01

The Most advanced chess game available for the Timex/Sinclair 2068 actually talks to you during the game. A digitized voice speaks through the computer's speaker, advising of its move, recommending moves for you and making facetious comments.

Voice Chess is written in fast machine code so it responds to your moves quickly.

Features include: analyze mode, recommend move, change colors or levels at any point in the game, save, reload and print out any game you play. Displays full Chess board in detail.

GULPMAN

Cat# SS03

The cursed wormoids are out to get control of Gulpland, chasing its inhabitants out of their apple orchards. Eat as many apples as you can to get bonus points and use your lasers to stun the wormoids. 15 different mazes.

Ordering Instructions: Include $3.00 S&H. VISA/MC Accepted.

Zebra Systems, Inc.

78-06 Jamaica Avenue
Woodhaven, NY 11421
(718) 296-2385

Dear TS Horizons Reader,

We were very pleased to bring you our 16-page 1986B Zebra Catalog as an insert into a previous issue of TS Horizons. That 1986B catalog is still our current catalog. Now, the three pages of Zebra advertising in this issue of Horizons contain a short list of catalog updates, plus several new product announcements, and sales.

Particularly exciting are the new bargain prices we are able to offer on Softsync's very high quality software products, and on our TS2068 compatible Trackball controllers. We will continue to strive to bring you the best support products for Timex computers and at the best prices.

Please accept our best wishes for the Holiday season and for a happy and healthy New Year.

Sincerely yours,
Jane, Linda, Jeff, Tom, and Stewart
The Staff of Zebra Systems

Zebra Best Sellers

For those who are interested, here is a short list of our currently best selling products to check out in our Time Designs ads and on the various pages in our 1986B Catalog.

TS2068 Trackballs (TD)
Sprites 2068 (TD)
Greeting Card/Banner/Sign Designers (P3)
TS2068 Technical Manual (P1)
Tech Draw Jr.(P2)
OS64 Cartridge (P7)
Mscript (P4)
64K TS1000 RAM PACKS (P13)
Machine Code Test Tool (P15)
Discounted Books (P10-11)
TS2050 Modem Boards (P12)

TS2068 Trackball Only $19.95

Originally sold for $69.95
Specify Cat# TBTMX02

Plugs into TS2068 Joystick Port and works with all joystick software.

Bonus Feature: Also works on Commodore 64, VIC-20, ATARI 800, and more. Contact factory for more complete list.

You can benefit from our recent purchase of brand new WICO Trackball Controllers at closeout prices. We've taken the model WICO originally made for the Texas Instrument 99/4A and made a very simple modification so it now is fully compatible with the Timex TS2068's joystick port.

WICO is the largest designer and manufacturer of control devices for commercial arcade video games. If you've ever played an arcade video game, chances are you've used a WICO joystick or trackball. You've experienced the superior control. The pinpoint firing accuracy. The exceptional durability.

Features: Phoenolic ball offers 360-degree movement. Two optical encoders provide split-second movement. Quick-action fire button for smooth, two handed arcade response and feel. Long 5' computer connection. Heavy duty plastic case for long hard use.

The WICO warranty has been voided by our modification. But we give you our 15-day money back guarantee and a one-year limited warranty from Zebra Systems.

Timex Games $2 Each

With your order for a TS2068 trackball you can purchase any of the following Timex TS2068 Trackball and Joystick compatible games at the special low price of $2.00 each for cassettes and $3.00 for cartridges.

CAT#	TITLE
Cassettes at $2.00 each	
64001	Androids
64002	Penetrator
64004	Casino I
64005	Crossfire
64006	Circuit Board Scramble
64007	Dragmaster
64009	Guardian
64012	Fun Golf
64014	Hungry Horace
64015	Horace Goes Skiing
64019	Horace and the Spiders
64021	Blind Alley
64023	Crazybugs
Cartridges at 3.00 each	
74001	Androids
74005	Crazybugs

$5 Off Tech-Draw Jr.

You can save $5.00 on the purchase of Tech-Draw Jr. if you purchase it at the same time as a TS2068 trackball. Instead of the regular price of 19.95 you can get it for 14.95. See our catalog for a complete description of Tech-Draw Jr. and a list of printers that it supports. Order Tech-draw Jr. Catalog# C256.

Holmes" graphically displays this. (External CPUs are not synchronized as is the HOME Z80.)

When the CPU tries to read port "A", it is sometimes detoured to reading a signal from the SCLD instead. The SCLD pulls data bit 0 low when it is not busy in case the CPU issues a delayed interrupt vector request.

This means the keyboard interrupt vector is 254.

BUSISO is not misleading. It is a local signal; the purpose of which is to prevent interference from the joysticks. There is no way for the joysticks to generate, nor interfere with an all 0's output on port "A". For this reason, 0's output on IOA0 thru IOA3 is a trigger signal to invoke BUSISO.

IOA5 (it really is) has another function. When BUSISO is triggered, it steers control to either of two port "A" devices. The value 0 is assigned in the TS2068 protocol for "mine". In practice, it is useful as a disable signal for the local controller when another buss master is in charge; though it is just as possible for the external buss master to use the same local controller.

When enabled, the "PCA" receives bytes through port "A" as multiplexed "nibbles". It also receives control signals over address lines A13 to A15. This is the existing system. Beyond that, you can build as elegant a system as you wish. This lets you build systems even more powerful than IEEE488. Bank switching is a typical add-on. It is best to use the bank switching protocol already established in the 2068 RAM code, but it can be changed if you want.

A small system with the 2068 being the BOSS is capable of up to 12 megabytes of memory. This is 253 banks of 7 switch- able chunks of 8192 bytes each. (Actually, it is unlimited when you define "superbanks".)

Contrary to published information, chunk 3 has the highest priority to be bank switched. It is in contention with DRAM. If not switched out, operations in chunk 3 (and chunk 2) will be a lot slower. (This has been discussed for the Spectrum.) A reconfigured memory assignment using chunk7 for the stack and the DOCK for SYSCOM could easily be considered standard. Oddly, it seems the bank switching routines were originally written that way before barriers were installed.

A multi-user system could be implemented with each user owning their own personal shadow in chunk7.

Going farther, you can relocate BASIC out of contention space, with parts of it stored in "overlays" from other banks. With proper technique, you don't have any need for FREE. BASIC can USR call any bank it needs.

PANDORA'S BOX IS OPEN!
LONG LIVE THE 2068! (AND CLONES)

A simple bank switcher latches nibbles, decodes some instructions, buffers an eight bit output buss, and little else. It is the those BEU chips which are the real workhorses. They contain HS, Bank# and Status registers as a minimum. They decode commands, issue BE when addressed, and often contain EPROM data. Whether you want serial or parallel polling, or daisy chaining is your choice. Initially, only 10 EXBUs can be implemented in SYSCON.

There is no stopping the independent development of great new hardware! It would be a mistake to merely adapt programs and hardware designed for the crippled TS2068... not because existing products are not excellent, but because they have had to work in an unfavorable environment. How much more effective it is to start with new goals! Why cling to old compromises? Why waste valuable time adapting?

See the annotated disassembly listing of WRITE_BS_REG for a guide to implementing bank switching.

Though this concludes this series on bank swithching the 2068, the subject has just begun. A book on it could weigh several pounds ...far outweighing this publication.

If it has inspired you to not accept a paraplegic TS2068 but to go after what you thought you were buying in the first place, then it has done its job.

TSH

© 1986 William J. Pedersen

The W&D&uP Co.
presents

TOURIST C

BANK SWITCHING IS HERE!
BE READY FOR IT.

Tourist C is really an extended bank switching disassembler and SPY program residing in BASIC. It uses machine code located above "COPYUP" in the machine stack. Printing to the 2040 is not usually desirable, so a universal interface is included. When used, the appropriate kernel is loaded into the printer buffer. Because this is an "overlay" it does *not interfere* with any usage by other banks or peripherals.

To help convince you of the great features of this program, send us no more than 60 bytes of any code you like and SASE. The W&D&uP Co. will return a disassembly of that code and more info about TOURIST C. How's that for bait? Try it.

The W&D&uP Co.
1128 Herrifield S.E.
Grand Rapids, MI 49507

Program: TOURIST C
Order #: TS2SPY868
Price: $32.50 inc P&H

WRITE_BS_REG

Enter with Reg D = msb Port Address = Q0 = qqq00000
Enter with Reg E = data byte = BIN YYYYyyyy

```
                                 AAA
Hex   Machine        Buss        111     IOA
addr  instruction    data        543    5 3210   comments
-----------------------------------------------------------------
635C  PUSH AF        F/A         011    x xxxx   Save Reg AF on stack
635D  PUSH BC        C/B         011    x xxxx   Save Reg BC on stack
635E  PUSH HL        L/H         011    x xxxx   Save Reg HL on stack
635F  LD H,D         **          011    x xxxx
6360  LD L,0         0           011    x xxxx   Immediate data
  ! HL = Q000
6362  LD A,(C000)    Y1         *110*   x xxxx   Get (C000)
6365  PUSH AF        Y1          011    x xxxx   Save (C000) on stack
6366  LD A,(Q000)    Y2         *qqq*   x xxxx   Get (Q000)
6367  PUSH AF        Y2          011    x xxxx   Save (Q000) on stack
6368  LD A,7         7           011    x xxxx   Immediate data
636A  OUT (245),A    7           111    x xxxx   Select PSG Reg 7
636C  IN A,(246)     Y3          111    x xxxx   Get (PSG_R7)
636E  LD B,A         **          011    x xxxx   Store (PSG_R7) in Reg B
636F  LD A,14        14          011    x xxxx   Immediate data
6371  OUT (245),A    14          111    x xxxx   Select PSG Reg 14
6373  IN A,(246)     Y4          111    x xxxx   Get (PSG_R14)
6375  LD C,A         **          011    x xxxx   Store (PSG_R14) in Reg C
6376  LD A,7         7           011    x xxxx   Immediate data
6378  OUT (245),A    7           111    x xxxx   Select PSG Reg 7
637A  LD A,64        64          011    x xxxx   Immediate data
637C  OUT (246),A    64          111    X XXXX   Set Port IOA to OUTPUT
  ! X XXXX = x xxxx if IOA was OUTPUT
  ! X XXXX = 0 0000 if IOA was INPUT
637E  LD A,14        14          011    X XXXX   Immediate data
6380  OUT (245),A    14          111    X XXXX   Select PSG Reg 14
6382  XOR A          **          011    X XXXX   Zero Reg A
6383  OUT (246),A    0           111    0 0000   Set IOA = 00
  ! Setting IOA bits 0 to 3 = 0 triggers BUSISO if not on.
6385  LD A,2         2           011    0 0000   Immediate data
6387  LD (C000),A    2          *110*   0 0010   Reset nibble counter
  ! The SCLD gates buss data to Port IOA on hearing this
638A  LD A,E         **          011    0 0010   Get data byte from Reg E
638B  LD (Q000),A    Y2         *qqq*   Y yyyy   Write lsn
  ! Y2 = BIN YYYYyyyy
638C  SRA            **          011    Y yyyy   Shift right Reg A
638E  SRA            **          011    Y yyyy   Shift right Reg A
6390  SRA            **          011    Y yyyy   Shift right Reg A
6392  SRA            **          011    Y yyyy   Shift right Reg A
6394  LD (Q000),A    Y2'        *qqq*   0 YYYY   Write msn
  ! Y2' = BIN 0000YYYY
6395  LD A,7         7           011    0 YYYY   Immediate data
6397  OUT (245),A    7           111    0 YYYY   Select PSG Reg 7
6399  LD A,B         **          011    0 YYYY   Retrieve Y3
639A  OUT (246),A    Y3          111    z zzzz   Restore Y3 to PSG_R7
  ! z zzzz = 1 1111 if IOA was INPUT
  ! z zzzz = x xxxx if IOA was OUTPUT
639C  LD A,14        14          011    z zzzz   Immediate data
639E  OUT (245),A    14          111    z zzzz   Select PSG Reg 14
63A0  LD A,C         **          011    z zzzz   Retrieve Y4
63A1  OUT (246),A    Y4          111    x xxxx   Restore Y4 to PSG_R14
  ! IOA alternate device BUSY can be dropped
63A3  POP AF         Y2          011    x xxxx   Retrieve Y2
63A4  LD (Q000),A    Y2         *qqq*   x xxxx   Restore Y2 to Q000
63A5  POP AF         Y1          011    x xxxx   Retrieve Y1
63A6  LD (C000),A    Y1         *110*   x xxxx   Restore Y1 to C000
63A9  POP HL         L/H         011    x xxxx   Restore HL
63AA  POP BC         C/B         011    x xxxx   Restore BC
63AB  POP AF         F/A         011    x xxxx   Restore AF
63AC  RET            OPC         011    x xxxx
```

Addresses *nnn* are memory mapped ports. The SCLD gates the write data to IOA. 011 and 111 are not ports. They correspond to fetches and accesses in chunks 3 and 7. If IOA is INPUT, the operation is ignored.

BUSISO can be triggered with IOA5 = 1. In this event, it is an alternative device of your choice. It is free to have its own rules for dropping BUSISO. It has a lower priority than the bank switching controller (though not limited to bank switching). If IOA5 = 0, the bank switcher is enabled and a BUSY state is seen by the alternate device.

PRODUCT: BYTE POWER
DESCRIPTION: TS2068 "Magazine-on-Tape"
PRICE: $5.50 / issue.
$49.90 / year (12 issues)
AVAILABLE FROM: BYTE POWER
1748 Meadowview Ave.
Pickering, ONT, CAN L1V 3G8

It's not every day that you read a review of a magazine in ANOTHER MAGAZINE. But BYTE POWER is a "different" kind of T/S magazine. . .it comes to you on CASSETTE TAPE!

BYTE POWER comes out monthly from Canada (home of Bob McKenzie . . . the "Great White North"). Each issue has over 10 complete programs ready to use. After LOADing the cover screen (which by the way is very well done), the Table of Contents describes each program contained in the issue.

And what programs! There are games, business programs, graphics, utilities, and more!

The best part is that you don't have to type them in. . .just LOAD and GO.

About the programs themselves. . .nothing less than top-notch! Any one of the programs could be sold by itself on the market. They're that good!

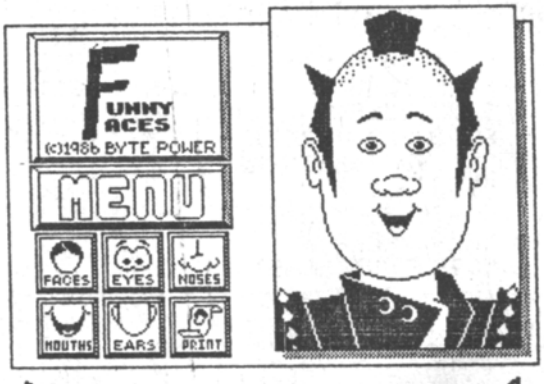
Some examples (from the first issue) are:
GRAND PRIX - A full-featured clone of Pole Position.
ROBOT - SPACE INVADERS at its best. . .and better! (My wife is addicted to it!)
KNIGHT'S TOUR - A chess-type game.
EASYTYPE - A simple-to-use Word Processor.
RENUM - Renumbering utility.

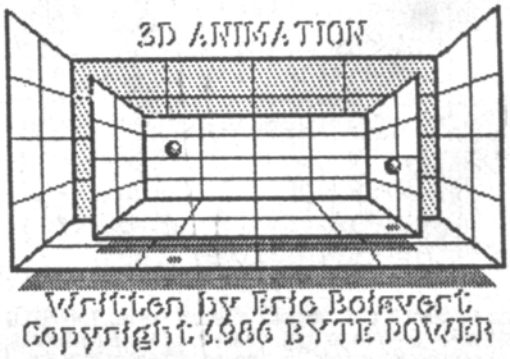
Besides programs, BYTE POWER also includes reviews, editorials, and even a classified section.

Eric and Kristian Boisvert, editors of BYTE POWER, are to be commended on putting out such fine software. BYTE POWER is bylined as a "1st Class Magazine", and I agree.

By all means keep your subscription to TS HORIZONS. . .but consider adding BYTE POWER to your list.

TSH





REVIEW: THE KRUNCHER
PROGRAM TYPE: Program-Compression Utility
PRICE: $9.95 (2068 VERSION)
AVAILABLE FROM: RMG ENTERPRISES
1419 1/2 7TH ST
OREGON CITY, OR 97045

Picture this; You've been working on THE program of all time; one that makes life easier, delivers world peace, AND cures the Common Cold. You're just putting the finishing touches on the last few lines, when...

OH NO! "Out of Memory" appears on the bottom of the screen. What do you do? Well there have been many articles written with tips on how to save memory in a program, like:

- Replace 1 with SGN PI.
- Replace 0 with NOT PI.
- Use of VAL statements for numerical values (Ex: LET X=VAL "6" instead of LET X = 6.)

You could go through your entire program, using these memory-cutting tips, taking valuable time, and possibly losing your creative train of thought.

OR. . . you could let THE KRUNCHER do it for you in a matter of seconds.

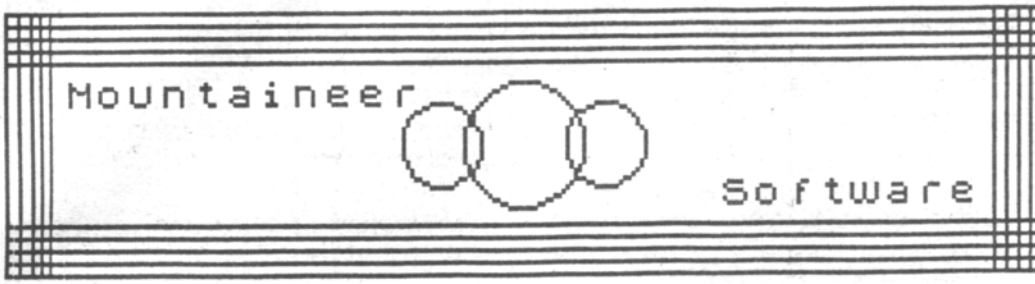
THE KRUNCHER is a new machine code, utility program from S&K Enterprises (distributed by RMG Enterprises). THE KRUNCHER code is totally relocatable, and virtually transparent to the user (except when activated).

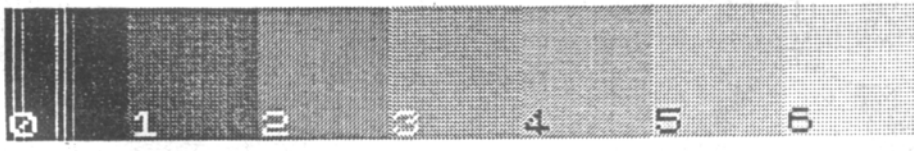
Using THE KRUNCHER is simple. LOAD the program, and follow the prompts. Select the memory location for THE KRUNCHER to reside (I usually use 64000), and then the program resets the computer with the code ready to use.

Then, either LOAD a program you wish to compress, or type in a new one. When you are ready for THE KRUNCHER to do its job, use the command:

```
Prog:colorchart (original)
Bytes Free: 37854

  5 INK 0: PAPER 7: BORDER 7: CLS
 10 FOR c=0 TO 7
 20 FOR i=9 TO 12
 30 PRINT  BRIGHT 1; PAPER c;AT i,c*4;"    "
 40 NEXT i
 50 PRINT  BRIGHT 1; PAPER 8; INK 9;AT 12,c*4;c
 60 NEXT c
100 PRINT AT 13,0
110 FOR v=0 TO 1
120 FOR h=32 TO 143: PRINT  INVERSE v;CHR$ h;: NEXT h
130 PRINT
140 NEXT v
200 LET yc=143
210 CIRCLE 108,yc,10: CIRCLE 128,yc,15: CIRCLE 148,yc,10
220 FOR x=0 TO 12 STEP 3
230 PLOT x,175: DRAW 0,-63
240 PLOT x+243,175: DRAW 0,-63
250 NEXT x
260 FOR y=112 TO 124 STEP 3
270 PLOT 0,y: DRAW 255,0
280 PLOT 0,y+51: DRAW 255,0
290 NEXT y
300 PRINT AT 2,2;"Mountaineer";AT 5,22;"Software"
```





```
Prog:colorchart (KRUNCHER)
Bytes Free: 38039

   5 INK NOT PI: PAPER VAL "7": BORDER VAL "7": CLS
  10 FOR c=NOT PI TO VAL "7"
  20 FOR i=VAL "9" TO VAL "12"
  30 PRINT  BRIGHT SGN PI; PAPER c;AT i,c*VAL "4";"     "
  40 NEXT i
  50 PRINT  BRIGHT SGN PI; PAPER VAL "8"; INK VAL "9";AT VAL "12
",c*VAL "4";c
  60 NEXT c
 100 PRINT AT VAL "13",NOT PI
 110 FOR v=NOT PI TO SGN PI
 120 FOR h=VAL "32" TO VAL "143": PRINT  INVERSE v;CHR$ h;: NEXT
 h
 130 PRINT
 140 NEXT v
 200 LET yc=VAL "143"
 210 CIRCLE VAL "108",yc,VAL "10": CIRCLE VAL "128",yc,VAL "15":
 CIRCLE VAL "148",yc,VAL "10"
 220 FOR x=NOT PI TO VAL "12" STEP INT PI
 230 PLOT x,VAL "175": DRAW NOT PI,VAL "-63"
 240 PLOT x+VAL "243",VAL "175": DRAW NOT PI,VAL "-63"
 250 NEXT x
 260 FOR y=VAL "112" TO VAL "124" STEP INT PI
 270 PLOT NOT PI,y: DRAW VAL "255",NOT PI
 280 PLOT NOT PI,y+VAL "51": DRAW VAL "255",NOT PI
 290 NEXT y
 300 PRINT AT VAL "2",VAL "2";"Mountaineer";AT VAL "5",VAL "22";
"Software"
```

RAND USR xxxx
(xxxx = memory location you selected)

THE KRUNCHER then goes to work, shaving off bytes of your program! As an example I have included two listings of a program - Colorchart - that prints a screen display like that shown below.

Notice the differences between the listings. Even though THE KRUNCHER listing seems longer, it uses 185 fewer bytes! Imagine what you'll save on a longer program!

THE KRUNCHER is a very useful utility for any serious programmer, and is availble for both the TS2068 and TS1000/1500/ZX81. **TSH**

ATTENTION ! ! !
SOFTWARE WRITERS ! ! !
GRAPHICS ARTISTS ! ! !

A while back, I did a comprehensive look at Word Processor software for the TS2068. I included a chart of all features so that a side-by-side comparison could be made.

I am now planning to do a similar review for TS2068 GRAPHIC software. In past issues, I have done reviews on several Graphic programs, but I feel a side-by-side comparison is needed.

I have already procured the following software:

ART FOR ALL AGES
ARTWORX (Version 1.0)*
GRAFFIST
MEGA-DRAW
MICRO-PAINT
PAINTBOX
PIXEL SKETCH & GRAPHICS EDITOR
TECH DRAW (JR.)
ZEBRAPAINTER
(* = I need a copy of ARTWORX (Version 1.1))

I am looking for submission on two areas to make this endeavor complete:

1) Copies of any other Graphic software for the TS2068 not mentioned above to include in the comparison.

2) Any graphics *produced* using any TS2068 Graphics program.

If you have either, please send cassette copies to me at the address below.

Software should include documentation, and graphics should be saved in SCREEN$ format. Include the name of the program used to producethe pictures. I plan on printing as many contributions as I receive.

The address is:

Bill Ferrebee
749 Hill Street #6
Parkersburg WV 26104

Send me your submissions and look for the article in TS Horizons in the near future! **TSH**

Now at last... TS-2068

The FootePrint Printer Interface

- for Centronics parallel printers
- works in both 2068 and Spectrum mode
- compatible with OS-64 & Spectrum emulators
- EPROM socket and on/off switch on board
- works with **both** Tasman and Aerco driver software
- plugs into cartridge dock—door completely closes with cable running back under computer
- frees up rear edge connector allowing other peripherals to be used; less chance of a crash
- print driver software for LPRINT, LLIST, and COPY included for 2068 and Spectrum modes

FootePrint Interface w/software & cable .$45.00
FootePrint with OS-64 option included ..$65.00
Bare board & instructions only $15.00
Cable only for use with bare board $15.00
All prices are pre-paid and include shipping charges.

FOOTE SOFTWARE
P. O. Box 14655 — Gainesville, FL 32604
904/462-1086 (6 pm - 9 pm EDT)

SCREEN - CALC 2.0

ELECTRONIC SPREADSHEET for the TS 2068. Holds 1008 cells with both a label and a numeric value; dimension set by the user. 150 user defined functions which accept all commands on the keyboard. Many other features including: FIND by label, IF...THEN...ELSE, loops, insert and delete columns, and single command totaling and averaging. Information can be printed with a 2040 or full width printer. The complete and detailed instruction booklet illustrates SCREEN-CALC and includes a detailed example.
SCREEN-CALC 1.0 is a similar program for the TS 1000/1500.
Write for a catalog with a complete description and other programs.

BANTA SOFTWARE
8088 Highwood Way
Orangevale, CA 95662
(916) 722-4895

America's BEST Timex/Sinclair Magazine is now the BIGGEST!

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